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Easy Access

Computers That Use Plain English Permit Vast New Applications

Machines Read Newspapers, Answer Tough Questions, Cut Use of Programmers

The Eve of Adam and Robot

By RICHARD A. SHAFFER
Staff Reporter of THE WALL STREET JOURNAL

The Defense Department clerk wants information on naval activities in the Mediterranean Sea. Sitting in front of a computer, he types out the following question: "What U.S. ships are within 200 miles of Naples?"

Seconds later, a screen on the computer lights up with the answer: "The Fox and the Philadelphia."

"Show them to me," the clerk types.

On the screen appears a map of the Mediterranean, with glowing dots representing the location of the ships.

The Pentagon exercise denotes a budding transformation in the computer industry. Until recently, working with computers usually required a knowledge of how the machines function and training in one of the code-like languages they understand. Persons without such training were confined to using computers for such simple tasks as booking airline seats or displaying bank-account balances.

Machines That Teach

Lately, however, computers are being developed that can respond to questions phrased in English (or any human tongue) and reply in easily understood terms. The plunging cost of electronic circuits and the discovery of more-efficient ways to store and process information have created computers that can even teach novices—in English—how to operate the computers.

Indeed, some computers now know enough English to read newspaper articles, answer questions about complex topics and solve problems written in everyday sentences—even when the human's grammar and spelling are faulty.

Within the next several years, experts believe, almost anyone may be able to use his own words to do almost any job on a computer. The Laboratory for Computer Sciences at the Massachusetts Institute of Technology is among those working toward this goal. Its director, Michael L. Dertouzos, says, "There are still any number of dangers that could hold us back, but the horizon looks clean and good from here."

That attitude also prevails at the Defense Department, which is testing a system developed by SRI International (formerly Stanford Research Institute) to keep track of ships at sea. "This new system is working so well that we'll probably be testing it aboard ships within two years," says Col. David Russell, director of the department's Information Processing Techniques Office.

Simple Benefits

Simplifying the use of computers, of course, lessens dependence on costly and scarce programmers. The trend will also benefit the increasing number of companies that are using small, decentralized computers, because few people at the remote locations know much about computer technology.

The simplification is also vital to the emerging computer markets of tomorrow: the automated office and home. At Xerox Corp., scientists are developing computer languages based on English words and symbols simple enough for young children to comprehend. Xerox is betting heavily on the proliferation of such computerized office equipment as electronic typewriters with memories.

International Data Corp., a Waltham, Mass., computer-industry research firm, is optimistic about the sales of so-called personal computers. About the size of a typewriter, the personal computer is used to play electronic games, balance checkbooks, keep track of recipes and perform a variety of other tasks around the home.

International Data estimates that sales of personal computers, which retail for an average of about \$3,000, should reach \$300 million annually by 1980—and twice that if there is a breakthrough in developing pro-

grams that are cheaper and easier to use.

Problems of Programming

Most computers are limited by their programs the way trains are limited by their tracks. And programming, like the laying of track, is a tedious, exacting process of guiding the computer step by step along the path it must follow to do its job. Some 500,000 steps of instruction are required for a computer to print a single insurance-premium notice, for example. What's more, the guiding must be done in language so precise that a single misplaced comma would derail the work.

To avoid these obstacles, computer makers are designing special programs for machines that the uninitiated will use. In addition to doing such standard business tasks as figuring a payroll, these programs use a television-like screen to explain the computer's operation. They also guide the layman with multiple-choice questions and a fill-in-the-blank technique.

"It's reached the level that virtually anyone who can type can use one of these computers," says Jack Shevillo, director of general products and systems for Burroughs Corp. In the company's B-80 computers for small business, he says, "simplicity is one of our big selling points."

Home computers are also coming into their own. Umtech Inc., a small Sunnyvale, Calif., company, has started selling a product called VideoBrain that plugs into a color television set. In addition to playing such games on the screen as blackjack, checkers and pinball, the \$500 machine can solve complex financial problems such as figuring bond yields and compound interest on loans. VideoBrain doesn't require any programming skills and asks for whatever information it may need by flashing questions on its screen.

Another machine that makes use of ordinary terms is Adam, a \$35,000 computer produced by Logical Machine Corp., also of Sunnyvale. Adam is about the size of a standard office desk and contains a keyboard and a screen. It comes with a small vocabulary including such words as begin, subtract and rename, and it learns other words in English or other languages in terms of those it already knows. A Frenchman, for example, might teach it by typing in: Rename begin to be commencez.

"The result is a computer so easy to use

it can be sold like high-fidelity components or motorcars," boasts Logical Machine's president, John Peers.

Aeromec Inc., a Clarksburg, W.Va., commuter airline, bought an Adam computer because it was tired of waiting weeks whenever it asked a computing service company to make small changes in the way it handled the airline's data.

"I had absolutely no experience with computers and was a little afraid of them," says Albert E. Gensel, Aeromec's director of administration. "Now I'm writing most of the accounting programs we use. In English. And I can change them in a few minutes whenever I want."

Enough other buyers are pleased with Adam that sales of the machine are doubling every six months, Logical Machine says, and it plans to bring out next June a \$10,000 version of the computer destined for two-to-five-person businesses. The firm also is experimenting with a model of Adam that talks. When an operator says, "Good morning, Adam," the machine turns on and replies, "Good morning. I am ready. What do you want to do?"

Computers essentially process data and make decisions by opening and closing millions of tiny switches. In the early days, computer programming involved manually changing the links between these switches. Later, when the links were stored in the machine's memory, the changes could be made through binary numbers, or ones and zeroes, known as machine code. Eventually, so-called higher-level computer languages such as Cobol and Fortran were devised to translate human language into machine code, which, in turn, alters the pattern of "on" and "off" circuits inside the computer.

Recently, these higher-level languages have come to look more and more like ordinary conversation. The ultimate goal is to enable computers to solve any problem presented in English. But that goal won't be met soon because of the difficulty of build-

ing machines that duplicate human-thought processes.

"At present, it takes a huge computer and sophisticated programming to do a small part of what a young child does naturally," says Terry Winograd, a computer scientist at Stanford University.

Yet remarkable strides have been made by limiting the topics the computer must deal with and through techniques that allow computers to imitate human reason, to break apart sentences and to examine the relation of words to each other.

Some machines, like the one being tested by the Pentagon, already deal with English well enough to answer practical questions and obey limited commands. Computers also are handling English with the aid of Robot, a computer program developed by Artificial Intelligence Corp., a small Kensington, Md., firm. By translating English into computer language, Robot enables computers to handle such orders as "Print me a report on the 1975 performance of the regional sales managers, broken down by item, region and gross profit."

Bigelow Sanford Inc., the Greenville, S.C., carpet maker, is using the Robot program with its computers to aid sales and marketing executives. "We expect that people who have been getting computer printouts two feet thick, which they don't read, now will be able to ask the machine directly for just the data they want," says Julian Pruitt, the firm's data-processing manager.

Other Applications

More such question-answering and command-obeying systems are expected to be applied in the next few years to such fields as the securities industry, where huge files of computer-stored information already exist. Other systems are being directed toward problem-solving—in English—in such fields as chemical engineering, thermodynamics and cost-accounting. Herbert Simon, a professor of psychology and computer science at Carnegie-Mellon University, says, "Very complex, real-world applications such as

medical diagnosis using natural language could be possible in five years."

At Yale, scientists have trained a computer to read newspaper stories, decide what is new in them and remember the important information. The machine can provide long or short summaries of the articles and answer questions about them—not by parroting part of an article but by drawing conclusions on the basis of the information.

In another Yale experiment, a computer impersonates George McGovern or Ronald Reagan and reacts to newspaper headlines the way its human counterpart might. In one recent demonstration, the computer, playing Mr. Reagan, was told: "Russia massed troops on the Czech frontier" and then was asked, "What will Russia do next?"

Reagan-Like Reply

"Russia may tell its troops to start the invasion," the computer said.

"What should the U.S. do?"

"The U.S. should intervene militarily."

Roger C. Schank, the scientist directing the Yale work, is cautious about its significance. "The future looks bright, however," he says, "and we're forming a little company to look into commercial applications."

The big computer companies are looking into the same thing. Although these companies are generally reticent on the subject of their research, International Business Machines Corp. says it is putting together a system at its Yorktown Heights, N.Y., research laboratories that will allow clerks in a nearby city's planning department to question a computer in English about land use. The company is testing another computer language so easily used that it has enabled IBM secretaries, clerks and engineers to replace some professional programmers.

A swift new tack for the time-sharing industry

'Distributed processing': A way to keep clients from buying their own systems

For some time now, doomsayers have predicted the ultimate downfall of the remote computer service industry—those companies that provide computer time and software by putting terminals in their customers' offices and linking them by telephone lines to their own large central computer. The downfall will come, they say, because of the incredible plunge in the cost of computer hardware, which makes it possible for time-sharing customers to buy their own computers.

Until very recently, the remote-processing industry has pooh-poohed that prediction, pointing to the hefty size of its business—\$1.7 billion in revenues this year—and its continuing growth. But with remarkable suddenness, much of the industry is now switching over to a different tack, one specifically designed to counter the threat of low-price computers.

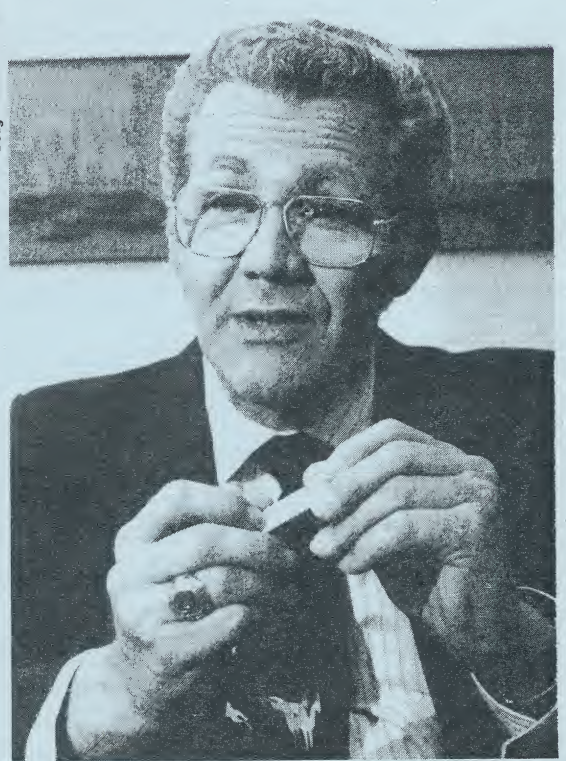
Most of the major time-sharing companies are now developing, and some are about to announce, a move into so-called distributed processing—an arrangement whereby much of their data processing will be decentralized and performed instead by smaller, less costly computers installed at customer sites. Links to more powerful central computers will still be available but will be needed for

only the most complex tasks or to process overflow data.

So far, distributed processing amounts to peanuts in the time-sharing business—3%, or about \$50 million annually, estimates Robert Colten, director of computer services for Gnostic Concepts Inc., a Menlo Park (Calif.) market research firm. But because of this newly emerging trend, he predicts that by 1982 distributed processing will account for 15% of the remote processing business—or \$600 million of the \$4 billion total.

Crucial move? What is forcing the service companies in that direction is the rapidly growing availability of powerful small business computers backed with sophisticated software. "When a user of computer services starts generating between \$4,000 and \$8,000 per month with a service company," Colten says, "then he can start looking at a small business system."

For that reason, more and more executives in the computer services industry think that a move to distributed processing could be crucial. "Over the long haul," says Bruce R. Wilson, corporate director of technology for Boeing Computer Services Inc., "large time-sharing companies are going to have to understand that the whole trend in going to more processing capability for less money is a shift to the client's house." What this all



Boeing Computer's Wilson: Cheaper hardware will lead to "a shift to the client's house."

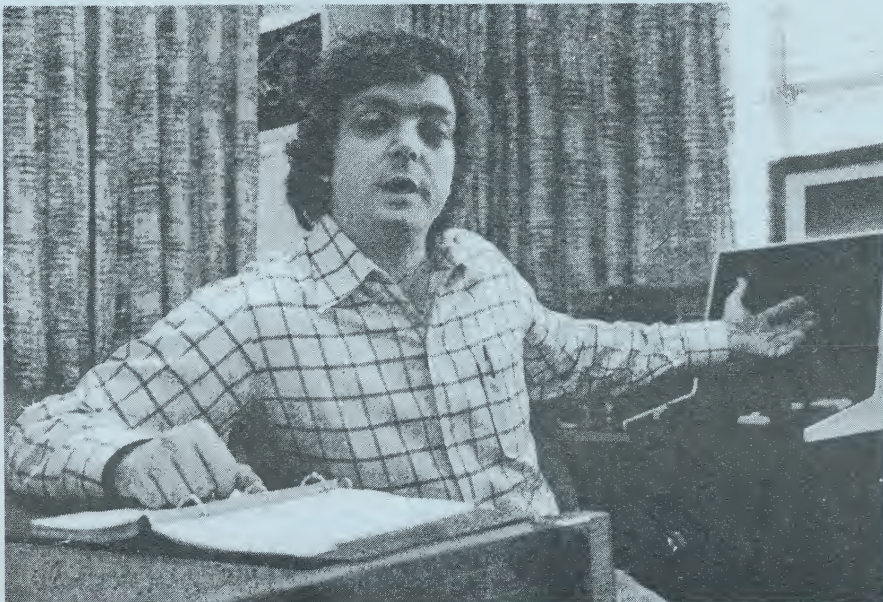
adds up to, declares C. Rae Quinn, a senior vice-president at Rapidata Inc., is that "we have no choice but to get involved" in distributed processing.

DEC's mainframe. Until recently, most of the development work centered on the minicomputer. Next month, for example, National CSS Inc. plans to announce a new mini that will provide its clients with on-site processing power as well as a link to the company's central computer center.

But the industry's biggest shove into distributed processing appears to be coming as the result of a new development by Digital Equipment Corp.—a mainframe computer called DECSYSTEM-2020, which the company describes as today's lowest-price mainframe (BW—Mar. 20). DEC's large-computer group already plays a major role in the time-sharing business, accounting for perhaps 30% of the installed computers. And its customers are moving fast with the new DEC mainframe, which starts at a price of only \$150,000:

■ Automatic Data Processing Inc. (ADP) late this month will announce a major program to offer the 2020 to its customers as an in-house processor linked to its existing time-sharing facilities. The Clifton (N.J.) company has

Patrick D. Pagnano



National CSS's Feinleib: "Some people have gone to distributed processing prematurely."

placed an order for 100 of these machines, according to DEC officials.

■ Tymshare Inc. plans to use the 2020 as an "applications engine" to move customers from the Cupertino (Calif.) company's shared DEC system to their own machines without a lot of reprogramming. Tymshare will get its first 2020 in May and "a series of them later in the year."

■ Rapidata also expects to get the new DEC computer in May, and if testing goes as planned, the Fairfield (N. J.) company hopes to place up to five machines at customer sites later this year.

■ CompuServe Inc. in Columbus, Ohio, hopes that the 2020 will attract new, smaller users to its time-sharing and software services.

■ Dataline Systems Ltd. in Toronto has signed a letter of intent to buy a 2020 and plans to offer the computer to its customers in a complete hardware-software package.

In fact, the trend is taking on landslide proportions. Says the president of one major time-sharing company, who does not now use DEC hardware: "Sure I'm nervous. Who wouldn't be scared when he sees a competitor like ADP, the biggest in the business, buying 100 of the

DEC's new mainframe is catching fire with the time-sharing companies

2020s." He has purchased a 2020 to study its power and performance.

Not all companies are in such a hurry. Boeing Computer Services has been running lots of "pilot experiments" with minicomputers to do the data processing before information is sent to the big central computer. The Morristown (N. J.) subsidiary of Boeing Co. is still doing its marketing "homework," though, and does not plan to offer this type of service for another two years or more, a company official says.

But even Jack Roseman, feisty president of On-Line Systems Inc., who declares that "I don't think [distributed processing] is the way to go," admits that his company's biggest competition is "the in-house [EDP manager] who wants to run his own show." Even so, Roseman figures that a move to distributed processing "is just one in a bag of marketing tricks—not our whole business and certainly not our salvation."

New customers. If the preponderance of development activity now focused on distributed processing is any measure, however, Roseman is in the minority in his industry. Laszlo Rakoczi, Tymshare's technical vice-president, is plainly excited about the prospects. "If I can maintain the client for seven years instead of two, I've got an immensely profitable business," he says. "Looking at the turnover of our customers, I look back and

shudder at the incredible waste. Most of those customers wanted to stay with us, but they couldn't afford it," Rakoczi adds.

Most time-sharing companies are counting on distributed-processing packages not only to keep old customers but also to bring in new ones. "It expands our potential," says Rapidata's Quinn. "Where a few years ago the only thing we offered was Rapidata services on Rapidata computers, now we can offer Rapidata services on our computers, his computers, or both computers."

CompuServe, for one, is counting on its move to distributed processing to extend its product line to smaller users that are not among the largest 1,000 industrial companies it now serves. And Boeing, when it gets going, expects to be able to sell to "different departments" of the companies that now make up its customer base.

Flexible software. As powerful a tool as the low-priced computer systems promise to be in the remote services industry,

CompuServe is counting on distributed processing to entice smaller customers

however, executives are quick to point out that their software is still the key to keeping a customer. Flexible software that can easily be modified by the user will be crucial, says Harold F. Feinleib, vice-president of systems development for National CSS. "You've got to look at a corporation as changing from year to year," he explains, "and the operating system has to change with the company." National is now working on its own applications language that it hopes will be easier for users to understand and work with than the complex computer-programming languages now being used.

Developing the necessary software, in fact, could be a factor in slowing down the flood of distributed-processing services that remote-computing companies are expected to offer. "I think some people have gone to distributed processing prematurely, without having the necessary software," says Feinleib of National CSS, whose company will start to deliver its minicomputers to customers late this year.

Companies that have invested huge sums in worldwide computer facilities, such as General Electric Co., naturally play down the advent of distributed processing in the remote computing business. But even the more conservative executives in the industry expect the distributed-processing trend to take hold within five years. "Raw computational power is moving to the other end of the phone line," sums up Boeing's Wilson. "All we can do is quibble about the timetable." ■